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Linguistic research at phonological and higher levels is reviewed. At the phonological level controversy centers around the phenomena of linguistic development, including reading, spelling, and pronounceability, and is accompanied by suggestions of how to help a learner cope with these phenomena. At the higher levels of apparent and underlying phrase structure and the semantic structure which goes with them, controversy occurs in such areas as grammaticality and dialectical differences. Implications of the research are that reading teachers must understand a complex set of linguistic principles, must be able to recognize those instances in which each principle is applicable, and must be able to apply appropriate instructional procedures in proper instances. A bibliography is included. (MD)

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SYMPOSIUM I EXTENDING FRONTIERS OF RESEARCH

Linguistics and Reading Instruction

Research Issues: 1968

During the last three years (1964-1967) Project Literacy
Reports provided an excellent setting for the informal presentation
of theorization and empirical research on linguistics and reading.
Some dramatic encounters between points of view in linguistics
itself were manifested in these Reports and there occurred some
surprising expansions in what, a few years ago, seemed to be the
only logical implications of linguistics for reading.

This review will be confined to tracing the issues which
have emerged in recent years and which are now in the process of
resolution. It is organized around two echelons of language:

(a) the phonological level and (b) the "higher levels." But, first, let us look at the partnership that generates the research that concerns us.

Distinctions and a Partnership.

The philosophic formulation of a theory of signs distinguishes among (a) the study of the relation of signs to the users of signs (b) the study of the relation of signs to their referents and (c) the study of signs themselves and the relations among them (9,27). The three domains are inter-related and inter-dependent. The distinctions are important, however, to help keep in mind the difference, for example, between the systematic analysis of language (linguistics) and the psychological problems of learning a language or of learning how to read.

The demarcation of the three levels of discourse seems to form natural boundaries among the academic disciplines that are concerned with symbolic behavior, psychology or psycholinguistics, semantics, and linguistics. Separated disciplines, however, do not always develop coordinated theories and compatible methods, especially, perhaps, when the disciplines are themselves subject to theoretical tensions.

On the other hand some early efforts to establish a discipline of "psycholinguistics" were peaceful and productive (28). More recently, language has become a testing ground for the implications of various theoretical positions in psychology (3,6) while attempts to clarify certain issues in linguistics have occurred in the context of psychological experiments(26). In addition, a very

vigorous line of investigation of childhood language acquisition plays a catalytic role.

Educational problems, such as reading, have no regard for the boundaries among formal academic disciplines and they stimulate a rapid shuttling between levels of discourse. As long as the necessary distinctions for defining sub-problems are kept clear, very exciting and productive research on linguistics and reading may be expected to occur in the context of today's disputes and tensions among psychologists and linguists of various persuasions.

It may be acknowledged that Bloomfield (5) may have ventured into education somewhat recklessly. But in attempting to order his materials from the simple to the complex, after he had arrayed them in the systematic manner suggested by his linguistic analysis, he did not deviate markedly from the educational and psychological dicta of his day. By the time his contributions were noticed by the reading field (8) his pedagogy seemed to have become obsolete.

Recently Venezky (29) conceived of reading as the translation of marks on paper to sounds as Bloomfield had. On the other hand, Venezky suggested, however, that the "notion of sequencing materials from the simple to the complex, the heart of the Bloomfield approach and of almost all the 'linguistic' approaches...is a 'sacred cow' that could be re-examined." He argued, for example, that while the pronunciation of certain letters depended on their

graphemic environment (e.g. "a" in "man" and "mane") it was a matter of pedagogic choice as to whether the two phoneme-grapheme correspondences should be taught sequentially or simultaneously. Ample data from learning studies are available to support Venezky's conjecture that "the potential generalization derived from the differentiation approach...certainly is greater than from the simple sequence method."

Similarly, Gibson, Farber, and Shepela (13) raised the question as to whether certain systematic, high frequency spelling patterns, could be abstracted by kindergarteners and first-graders using a "learning set" procedure. Drills with negative and positive instances of several patterns were presented so that the abstraction of the superordinate principle became possible, following principles Harlow (18) had developed working with monkeys many years earlier.

While only one in twelve participating kindergartners completed the experiment, three out of five of the first graders who did showed evidence of forming learning sets by solving at least 80 per cent of the problems at the end of the five-day study. The conclusion that these young pupils actively searched for an underlying pattern on principle, even if it was a wrong one, was substantiated by individual response patterns, by the remarks of the pupils, and by the fact that those who had not succeeded in abstracting the patterns scored consistently at less than chance levels.

The study suggests that in addition to understanding the linguistic phenomena involved in any problem in learning how to read, the educational process must be accompanied by an understanding of how the learner may cope with these phenomena. In the difference between kindergartners and first graders, the study reiterated the obvious and pervasive educational percept that coping abilities and strategies may be expected to follow developmental patterns. In this form the implication follows that concepts such as readiness should not be considered in general molar terms, such as "reading readiness," but can be broken down to more specific readinesses such as "readiness to establish learning sets," "readiness for phoneme or letter-sequences of X length," "readiness to handle disjunctive possibilities in the fact that the same letters may represent more than one sound," etc. (21). Data of this type, it may be argued, are relevant to determining how much of which method is appropriate at what point in the learning process. The value and function of partnership of linguistics, psycholinguistics, and reading pedagogy is illustrated by the studies cited.

Theory and Research on the Phonological Level

As far as the reading profession was concerned, (2) linguists had "demonstrated the primacy of speech" over writing. It had been noted that speech was historically earlier than writing and that writing, in its modern form, is essentially speech written down. In both the foreign language field and in reading, linguistics seemed to imply to many to be the proper sequencing of the development of communication skills for the modern literate human is a recapitulation of his historic development.

For linguistics, reading was thus the "decoding" of the phonetic values of the letters upon the page (8). Even Lefevre's "linguistic approach" (24) which considered the sentence as the basic unit of communication, emphasized sentence intonation, or what linguists call the "suprasegmentals," as thought reading were a process of making texts audible. The linguist, Charles Hockett, (19) concluded that the logical essential policy in literacy training was to "teach the correlations between graphic marks and linguistic units."

Since English spelling is such a graveyard of the history of the language, there is less than perfect certainty as to correlations between writing and speech sounds. The relative frequencies of the applicability and inapplicability of various types of correspondences between spelling and pronunciation

across large samples of text may be ascertained by means of computers (31). Venezky's (29) classification scheme for the study of phoneme-to-grapheme correspondences consisted of the following:

- a. Predictable correspondences including
 - 1. those which were invariant and
 - 2. those which vary according to storable rulestogether with
- b. Unpredictable correspondences including
 - 1. "affix aided" ones (or those that occur as a result of a morphological change e.g. sign → signal)
 - 2. high frequency unpredictable correspondencesand
- 3. low frequency ones.

On the instructional side, Williams (33) proposed the "systematic investigation of...variables basic to the development of effective instructional sequences." These included concern for 'sounding out' grapheme combinations, phoneme blending, phoneme differentiation, grapheme discrimination, associative learning of individual graphemes and phonemes."

When, however, Venezky (29) attempted to test empirically the degree to which the statistical properties of his sound-to-spelling

correspondences were relevant to the reading process, he encountered some anomalies. His subjects were college sophomores, sixth-graders, and third-graders. His first hypothesis was that the frequency of occurrence of variant responses to unpredictable patterns would correlate positively with the frequency of occurrence of the pronunciation of real English words. He made up "nonsense" words containing some of the spellings in question and asked his subjects to pronounce them. His hypothesis did not prove to hold in all cases.

Second he hypothesized that pronunciations based on form class would vary according to syntax in sentences but would vary randomly out of text. Initial "th" is voiced in English only in the case of noun markers and a few other function words (e.g. the, there, that,) but voiceless as the initial consonants of "content" words (think, thing, etc.). Venezky asked his subjects to pronounce invented, or "nonsense" words containing "th" in initial position which he presented both in list form and in the context of sentences. Contrary to expectations, his subjects always preferred the voiceless phoneme and they did so even in sentences that were arranged so that the invented words seemed to be a function words. Indeed stress patterns of sentences would be awkwardly altered so that the invented word would appear to be a content word.

Venezky tentatively concluded that spelling-to-sound habits are strongly word oriented. It is as though "an alert were set

for members of a limited group of stimuli... When no limited group exists for a variant pattern, strategies based on word analogies are employed."

Much of Venezky's study suggested that additional factors other than invariant or variable letter-to-sound relationships effect the decoding of the printed page. The findings came as no surprise. Many experimenters in reading frequently cited Cattell's study of 1885 (7) which suggested that perception involved a grouping of stimulus elements which in the modern scientific vernacular they called "chunking." In the 1940's the psychological experimentation in what was called the "new look in perception" (comprehensively reviewed by Allport (1) explored a myriad of factors accounting for variations in the boundaries and perceptibility of various kinds of "chunks."

Among the factors that were at one time or another identified in the perceptibility of sequences of letters was one called "pronounceability" in the recent reading research. But rather early in the history of American linguistics, Benjamin Lee Whorf pointed out that in each language there were certain phoneme strings that were more likely to occur than others and that in writing there was a parallel in respect to letter strings (32). When "nonsense words" or perhaps better, "pseudo words" are made up by the speaker of any language, they are not comprised of a random sample of all possible human speech sounds arranged in

random sequences but they are a set of phoneme strings that are very much a product of the language of their constructor. They are characterizable manifestations of the phonology of the constructor's language containing exclusively the speech sounds of his language. They are arranged or sequenced according to the constraints and probabilities of that language for sequencing its speech sounds. In short they are possible words of the constructor's language which do not happen to exist. (Brillig, slithey, and toves become words only when Humpty Dumpty gives them meaning).

In a study by Gibson, Schurcliff, and Yonas (14) glurck was an example of a pronounceable English pseudo-word but ckurgl--which had to be constructed by special effort using systematic permutations--was an unpronounceable one. Pronounceability had been objectively arrived at and verified by counting the number of various pronunciations each word evoked from readers who were asked to say them; the greater the variety of pronunciations the less pronounceable. This measure correlated quite well with ratings of pronounceability, $r=.83$.

Gibson and her associates knew from many previous studies that when pronounceable pseudo-words are presented by means of a tachistoscope for intervals so brief that it was hard to recognize them, they are, nevertheless more easily recognized than words that are not pronounceable. It had indeed been shown in her laboratory that blind readers of braille had less trouble with

pronounceable pseudo-words than unpronounceable ones. But why was this true? What about pronounceability made the words easier to read? What materials could be identified as accounting for this phenomenon?

The point of the departure for the study by Gibson, Schurcliff, and Yonas was the notion that the "rules of spelling-to-word mapping suggested that mapping invariance creates larger units for reading and therefore faster processing." That is to say, the pronounceable chunks tend to occur with invariant spelling patterns. This was the very notion implied by Wier and Venezky when they added morphophonemic-spelling correspondences to their phoneme-grapheme ones in their statistical studies. But was it the "transitional probabilities"--the fact that certain two letter (bigram) and three letter (trigram) strings are more likely to occur than others--that accounted for the observed difference in the hitherto existing data, as Anisfeld believed? Or was it because pronounceable words were better "matches" to acoustic representations held by the reader and, as Levin and Beimiller believed, there was auditory encoding before final reading? Or, similarly, was it because "processing of letter-strings in reading involves encoding and matching to an articulatory representation or 'plan'" as implied by Liberman, and his associates in their "motor theory of speech perception?" Or, finally, was it because "complex morphological rules cover structural patterns of letters permissible in English words"? These imply a

"kind of syntax, analogous to grammar" for phoneme-strings and letter-strings very much like that formulated by Whorf many years earlier--and apparently unnoticed, or at least not cited, by the experimenters.

By comparing the effect of pronounceability on hearing and deaf-mute readers, Gibson and her colleagues attempted to discover whether the constructs of acoustic or articulatory representation were necessary to explain the differences between the readabilities of pronounceable and unpronounceable words. It turned out that pronounceability did indeed facilitate the reading of tachistoscopically presented words for deaf-mute subjects, as it did for hearing ones.

Then do bigram and trigram frequencies which can be processed exclusively in the visual mode remain to account for the difference in readability? The answer was: No. Measurements of bigram and trigram frequencies in stimulus materials did not facilitate the readability of the materials for either deaf or hearing subjects and correlated negatively, if at all, with the measured pronounceability of the words.

The experiment may not be taken to prove, however, that articulatory or acoustic representation do not play any role in reading. Liberman's notion of articulatory representation in the hearing of speech was formulated in the context of a mass of electrographic and myographic data. Hardyck and Petronovich (17)

have, furthermore, collected convincing data indicating that speech movements play at least a facilitative role for at least some readers and for at least certain categories of text.

Since accoustic representation is, to date, not accessible to any form of direct scientific obervation, the notion that we hear what we read is appealing only on a private level rather than on a scientific basis. It is credible primarily to those of us who are sometimes told we are poor and slow readers and who subjectively think we sometimes hear ourselves when we read or write. Thus, since it was also true that in the experiment in question the general performance of hearing subjects was superior to deaf subjects in reading tachistoscopically presented pseudo-words, it may be advisable to think of all the hypothesized constructs, such as auditory and articulatory representation, as comprising a multiplicity of facilitative processes rather than as factors which are necessary and sufficient conditions, each competing to account completely for the phenomena in question.

The results of the experiment implied to Gibson and her associates that "pronounceability ratings...(measure) morphological regularity (rules governing the internal structure of English words) and that it is this kind of structure in pronounceable words that facilitates perception." The relation between the auditory properties of the words, that is, their pronounceability, was traced back to the development of the writing system which evolved in relation to sound. The experiment seemed to imply that

although "writing is a surrogate for speech... morphological rules are rules in their own right and apparently can be learned as such."

Two linguists of different theoretical persuasions provide background. Charles Hockett (20) argued on his part that since English written words are not a simple and direct representation of spoken words "...a kind of representation [is to be sought]... from which both the actual spelling of the written word and the actual pronunciation of the spoken word are completely predictable." The unit by which this "spelling" is to occur is the "morphon;" a kind of representational system or alphabet which is perhaps developed intuitively by every literate individual. Once explicitly identified, the "acquisition of literacy in English [would involve]... building-in of this additional implicit level of representation." A number of problems in this formulation have already been identified by Hockett as has research in developing specifications and statistical properties of the "morphons" by at least one of Hockett's students, Daniel Kimball.

Hockett also supplied perhaps the most lucid statement of the opposing position of Noam Chomsky. Chomsky sees the basic representational system to be the general grammar of English (rather than the specific set of morphons as mediators). In the output of sentences, this grammar may generate either written sentences or spoken ones." The written sentence need not be

interpreted as representing a spoken sentence....."

A close examination of Chomsky's view (10) reveals it to be quite radical. First he "offered several arguments [throughout his writings] in support of the conclusion that there is no linguistic justification for a phonemic level. ...Phonemics... in the modern sense, is perhaps nothing more than a methodological artifact." Next Chomsky took the position that the representation of words in a dictionary "provides a natural orthography for a person who knows a language and that the relation between conventional spelling and phonological representation is very close... Conventional spelling is by and large a highly effective system for a wide range of dialects because it corresponds to a common underlying phonological representation relatively invariant among dialects despite wide phonetic divergences."

For Chomsky, phoneme-grapheme or sound-letter correspondences was a pseudo-issue even before research on it was begun. Hockett's adduction of "morphons" seems to provide a compromise. It moves away from the classical linguistic Bloomfieldian view of reading to an alternative position not quite as radical as Chomsky's.

But Chomsky concludes that "sound-letter correspondence need hardly be taught, particularly the most general and deepest of these rules... [They are] part of the unconscious equipment of the non-literate speaker. What [essentially must be learned] is

simply the elementary correspondence between the underlying phonological segments of his internalized lexicon and the orthographic system."

Although it is "not clear [to Hockett] how this approach might suggest pedagogical procedures other than those suggested by the classical (Bloomfieldian) view" it does seem to us from the nature of his arguments, described above and theory and data developed by his adherents, which are to be described in the following discussion, that for Chomsky the implications of linguistics for reading come full-turn around to the methods of basal readers or "look-say," procedures.

He does so, however, with considerable and noteworthy circumspection. "Children," he notes "may well...hear phonetically [i.e. in terms of the minutest details of speech sounds] not phonologically." A child of six about to learn to read may not have mastered the phonological system--the system of auditory or articulatory contrasts on a series of relevant linguistic dimensions.

Thus, we may suppose that for Chomsky, even if the mature reader may read with underlying structures of grammar or sentence content playing an important role in his perceptions, the phonetic and phonemic analysis may be the "indicated" procedures for teaching children to read at early stages of linguistic development.

Developments at the Higher Levels of Linguistic Analysis.

Chomsky's matrix for linguistics (4) distinguishes four levels:

- (a) phonology
- (b) apparent phrase structure
- (c) underlying or "logical" phrase structure
- and
- (d) semantic structure of sentences.

In this formulation it would seem speech starts with perhaps some "notion" or "idea" which may be expressed by many superficially different sentences. This "semantic structure" is mapped onto an underlying or "logical" phrase structure.

Transformations from this underlying structure generate a variety of sentences with apparent or surface phrase structures. For example, from a "kernel" sentence: (1) The poor sold the meat-transformations may be derived such as:

- (2) The meat was sold by the poor.
- (3) The poor were the sellers of the meat.

The final expression of the sentence is achieved when the "phonological component of a language maps the surface phrase structure onto a sequence of articulatory movements." We have noted above that the final mapping may occur into written form as well as spoken, phonological, form.

A number of above average, college level readers were

presented with sentences using a tachistoscope. In one task they were asked to match the sentence they were shown with the same or slightly different sentence they heard, indicating whether the two sentences were the same or different. In a second task they were required to tell whether two visually presented sentences were the same or different. In this study entitled: "How to Read Without Listening," Bever & Bower, (4) reported that 92 per cent of the subjects were found to be more proficient at the task requiring the matching between the auditory and visual modes while the remaining 8 per cent excelled in the within-mode matching. If the tentative interpretations of the investigators prove correct, it was further found that 92 per cent "listening" readers tended to forget from right to left (that is to say, they remembered the beginnings of sentences better than the ends) while the forgetting of the 8 per cent "looking" or visual readers seemed to depend on the semantic structure of the sentence since they perceived and recalled key words, not particularly from left to right. The 8 per cent visual readers seem to have found the "underlying subject" regardless of the word in the apparent phrase structure presented to them. The visual readers seem to have translated into simple declarative form which has the surface form most similar to the underlying phase structure or what Chomsky calls the "kernel."

It seems to be as though these 8 per cent visual readers read directly for meaning. The investigators reported that the faster comprehending "visual readers" they found appear to have instructed themselves, though it may be added, the reading field has labored long and hard to produce "visual readers."

The Bever and Bower study implies that decoding at word, phrase and sentence levels (rather than at the phoneme-grapheme level) can play a role in reading at an advanced level and, suggest as does the study by Gibson, Schurcliff, and Yonas, that, at least at advanced levels, speech or covert auditory processes need not play a role. Other studies suggesting that semantic and grammatical considerations may play a role at all levels of proficiency either do not raise the question of mediation by speech and auditory processes or suggest that these processes frequently do play a role in reading. The fact that Bever and Bower confirmed the notion that there are two kinds of readers shows that these findings are not contradictory. Since the studies all emanate from a linguistic point of departure, the need is manifested for modifying the notion that linguistics focuses on the "primacy of speech" for the teaching of reading.

A study by Rose-Marie Weber. "Grammaticality and the Self-correction of Reading Errors" (30) was based upon taped recordings of a class of first graders reading to each other - in the absence of their teachers at the end of their first year. Sixty-three

per cent of a substantial number of errors were of a nature that did not affect the grammaticality of the sentence (i.e. did not comprise grammatical "mistakes",) 29 per cent left the sentence grammatical up to and including the error but rendered it ungrammatical for the rest of the sentence and 8 per cent rendered the entire sentence ungrammatical. Among the better readers, the "high group," errors that did not effect grammaticality comprised a somewhat greater proportion of their total errors while the categories of errors tended to be more evenly distributed for the "low group." In the sample of errors that were corrected, violation of grammaticality accounted for approximately 61 per cent for the high group and about 45 per cent for the low group. In a sample of errors uncorrected by the high group, 96.2 per cent were of the type that did not effect grammaticality, while 45 per cent of the uncorrected errors in the low group did render the sentences ungrammatical. In short, among good readers on the first-grade level errors tended not to violate grammaticality and grammaticality accounted to some degree for which errors were corrected. The trends were much less distinct for poorer readers.

Weber's study raises the question as to what comprises grammaticality. If, for example, poorer readers might be -- as they often in fact are -- those who also speak a dialect different

from the one in which the text is written, might not a grammaticality that is alien to them fail to facilitate their perceptions of the structures of the sentences and to a tendency to leave uncorrected an error that renders the sentence ungrammatical only as far as standard usage is concerned?

Kenneth Goodman (15) raised the question of dialect barriers to reading comprehension and in a number of alternative ways it has motivated and justified the exploration of the dialects of the "urban deprived" under the rubric of research for the improvement of reading. A number of researchers have been laying the groundwork that will make possible a thorough-going analysis of the relation between the syntactic structure of a reader's dialect and the dialect of the text. For example, Paul Cohen in his "Outline of Research Results on the English of Negro and Puerto Rican Speakers in New York" (11) attempted to identify the sources of structural conflict relevant to reading. The methods used for collecting data from a stratified sample of Harlem residents included a "Perception Test" requiring, for example, discriminations between "messed" and "mess" or "messed up" and "mess up" and a "Classroom Correction Test" in which respondents were asked to put sentences such as [He pick me] into "good schoolroom English." A set of phonological features

were identified in the dialect which were shown to be those that destroy the distinctions marking (a) the future tense, (b) noun plurals, (c) third person singular, (d) the present tense, (e) the past tense, etc. Incidentally, the investigator reported finding no correlation between the "Classroom and Correction Test" and the "Perception Test" (citing examples of extreme cases that reached upper and lower ceiling values without mention of a statistical measure) and remarked: "all of this would seem to indicate the possibility that much time, energy, and money expended on auditory perception training might be more profitably spent elsewhere in the curriculum. Certainly this study and the following one to be described suggest that the relevance of auditory acuity for reading should be examined with considerable circumspection.

The implications of dialect variations for reading seem to be somewhat more complex, however, than may be at first anticipated. In a later paper, Labov and Cohen, (23) in analyzing the "Systematic Relations of Standard and non-Standard Rules in Grammar of Negro Speakers" report that many Negro speakers of the non-standard dialects show evidence of mastering the perception and comprehension of both standard and non-standard speech. In production, however, they translate or form all utterances in the non-standard dialect. When two dialects in production were noted,

they were found to be correlated with increasing socio-economic status. The methods used involved the establishment of situations to evoke formal and informal communication. The findings seem to be quite in accord with observations made in Europe, and elsewhere. In French speaking Canada, for example, radio, theatre, press frequently exhibit differences from the French of the general public who understand, but do not use the formal language. The Labov - Cohen findings, coupled with the results and interpretations of the Bever-Bower study and Weber's examination of errors make it seem reasonable and possible that under certain circumstances and with certain types of instruction, speakers of a non-standard dialect may be able to comprehend standard written text and even translate into their own dialect as they read silently. Certainly the problem turns out to be more subtle than it would at first appear.

Kolers (22) turned letters upside down, right to left and inverted his text in a number of studies in which these manipulations were intended to impede the skill of able college students although they were able to adjust to them. At first the experimental subjects were concerned with the transformations and comprehended little. Later they began to read fluently showing that "recognizing a word involves processes different from the mere recognition of its constituent letters" and that syntax and semantics play a role in producing errors and facilitating reading.

Levin and Turner (25) explored the relations between "Sentence Structure and Eye-Voice Span" for subjects ranging from second grade to university freshmen. A device for turning off the illumination on a text at any point while a subject read aloud made it possible to measure the "eye-voice span," or the amount of text a subject could keep saying after the turn-off. As might be expected, the eye-voice span was found to be statistically significantly greater for materials presented as sentences than for lists. The investigators further concluded that the number of times the eye-voice span coincided with the ends of phrases was statistically significantly greater than might have occurred merely by chance coincidence of a reader's eye-voice span ending at a phrase juncture. The rather involved measurement procedure for arriving at this may perhaps be questioned. It would have been more straight-forward to examine data as to the relatively frequency with which eye-voice span coincided with phase juncture in a large number of trials. Yet the results are comprehensibly in line with the findings of other experiments. Since this experiment confirms the well-established principle that reading occurs in terms of chunks of grammar and context, the true practical and theoretical value of the study will derive from the eventual analysis of the relationship between various grade levels, or developmental stages, and both the length of the eye-voice span and the specific grammatical structures of the stimulus materials.

Conclusion:

The linguist's understanding of language seems to be bringing new dimensions to the psychologist's and reading specialist's experimentation with the reading process. But the notion of "primacy of spoken language" must be modified in light of the data reviewed here to mean only that speech preceded writing in the history of man and precedes writing in the development of individuals. Spoken language may or may not play a role in the processing of written language. The data seem to suggest that whether or not it does depends on the individual, his reading level, and perhaps the nature of the text. The inter-relations among language systems, such as written and spoken ones or varieties of dialects, may be quite complex and vary from individual to individual. Yet linguistic structure and meaning incontrovertibly play an important role in reading--as does the translation of letters to speech sounds (in the case of alphabetically written languages).

The material reviewed in this paper clearly defeats any earlier and naive expectation that a "linguistic approach" might be formulated that would radically depart from previously developed instructional procedures and successfully compete with them. Indeed the doctrinal disputes within linguistics as they are manifested in connection with the reading process, seem to be

but slightly modified echos of the debates between advocates of phonics and basal reading in the reading field. Yet the added sophistication that linguistics brings to the experimentation is of undeniable value.

The reviewer is encouraged by the material discussed in this paper to anticipate that investigators who have attended to linguistics are en route to identifying a number of important principles of the reading process, of how reading skill is acquired, and of how human language processing capacities develop. There are some hints in this paper, and considerable evidence elsewhere, than among these principles is the fact that at least some reading skill and much language acquisition is the consequence of explorations and learning strategies that at least some learners initiate themselves. The implications for instruction are not that the isolation of these principles will lead to the development of "bigger and better" all-encompassing, panacea-like methods of teaching reading. Instead it may be expected that the effective and expert reading teacher (a) will need to understand a rather complex set of principles, (b) will have to be able to recognize each of the specific instances in which each principle is applicable, and (c) will have to be able to apply an appropriate procedure (including, perhaps, appropriate waiting strategies in which self-instruction occurs) in the proper instances.

To despair of developing such expertise on the scale necessary to teach reading in the schools is to despair of improving the effectiveness of reading instruction. The inescapable facts are that for language processing there are developmental stages in maturation and learning, that there are marked variations among individuals, and that the underlying principles of learning and language processing are complex. No single, blindly-applied method can be universally appropriate. Despondency as to the likelihood of developing the expertise to cope with these facts may, in part, be generated by a history of concentrating a major portion of available resources and talent to developing relatively monolithic methods rather than to developing extensive expertise among instructors of reading. But the principles that seem to be emerging from the research generated by the partnership that introduced linguistics into research on reading may call for and warrant new approaches to developing expertise among instructors of reading. The development of germ theory did not bring medicine a panacea for curing all ills--as some might have expected at first--but lead to the development of large number of specific drugs and curative procedures and to the development of physicians with more profound understanding of the principles of physiology and greater skill in their craft.

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